Electronic Supplementary Information: Mixing and demixing of binary mixtures of polar chiral active particles

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Supporting Movie

Movie 1. Evolution of the mixture of the clockwise (blue) and counterclockwise (red) particles at $g = 0.0$ and $\omega = 0.5$. The other parameters are $\rho = 0.50$, $v_0 = 1.0$, and $D_r = 0.001$.

Movie 2. Evolution of the mixture of the clockwise (blue) and counterclockwise (red) particles at $g = 0.1$ and $\omega = 0.5$. The other parameters are $\rho = 0.50$, $v_0 = 1.0$, and $D_r = 0.001$.

Movie 3. Evolution of the mixture of the clockwise (blue) and counterclockwise (red) particles at $g = 0.3$ and $\omega = 0.5$. The other parameters are $\rho = 0.50$, $v_0 = 1.0$, and $D_r = 0.001$.

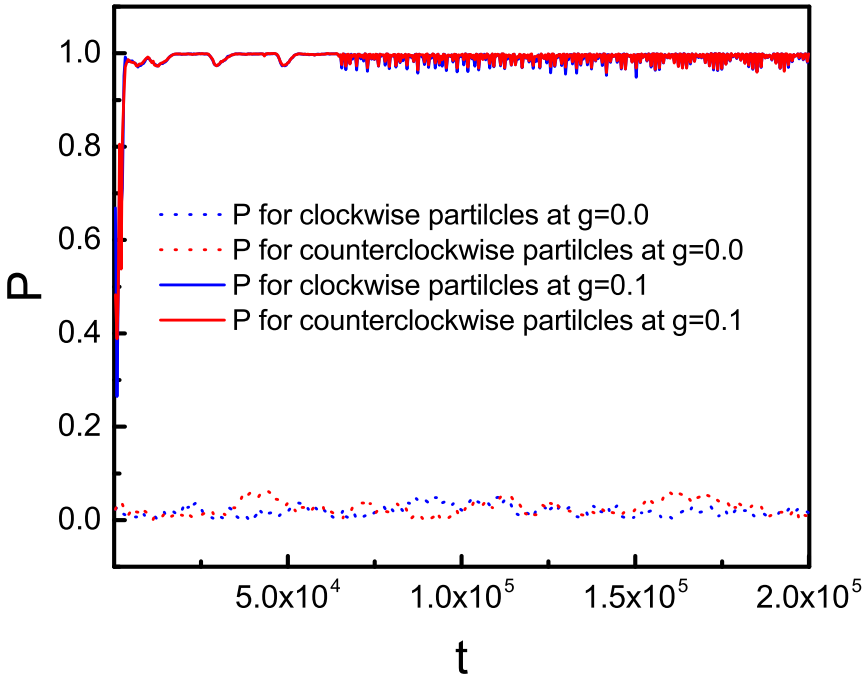

Figure S1. Polar order parameter of each particle specie as a function of t for different values of g at $\rho = 0.50$, $v_0 = 1.0$, $D_r = 0.001$, and $\omega = 0.5$. When the integration time increases from 10^5, the polar order parameter of each particle specie changes very little (does not drift), which shows that the total integration time is sufficient to ensure that the density profile of the system has reached steady state. Note that though the polar order parameter of each particle specie tends to 1 at $g = 0.1$, the average polar order parameter for two particles species is about 0.6 (shown in the manuscript).

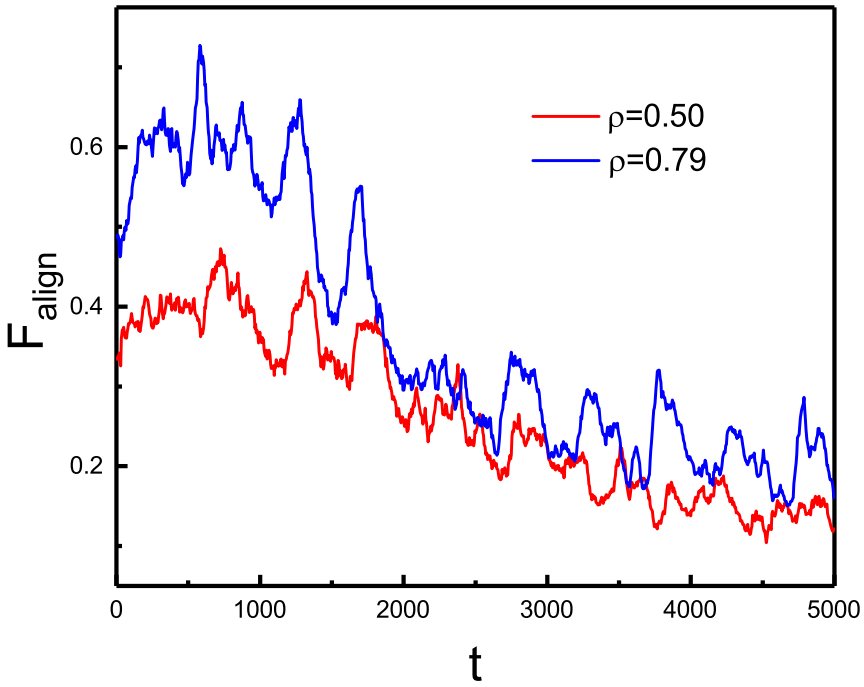

Figure S2. Average alignment interaction magnitude F_{align} as a function of t for different values of ρ at $g = 0.1$, $v_0 = 1.0$, $D_r = 0.001$, and $\omega = 0.5$. In order to investigate the role of the alignment interactions on the particle configuration, we define the average alignment interaction magnitude $F_{align} = \frac{1}{N}\sum_{i=1}^{N} |\frac{g}{\pi R^2}\sum_{j\in\partial_i} \sin(\theta_j - \theta_i)|$. When $t < 2000$, the average alignment interaction magnitude at $\rho = 0.79$ is greater than that at $\rho = 0.50$, which shows that the role of the polar alignment is more pronounced for the large packing fraction. On increasing t from 2000, F_{align} is significantly reduced. This can be explained as follows. In the initial stage, the orientation θ is random, the polar alignment dominates the dynamics of the system. When the polar alignment works for a long time, the polar order of the system increases greatly, thus the average alignment interaction magnitude significantly decreases.